Tayco Street Bridge
Spanning Government Canal
Tayco Street at Water Street
City of Menasha
Winnebago County
Wisconsin

HAER No. WI-68

HAER
WIS
70-MENA.V,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Rocky Mountain Regional Office
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

HAER
WIS
70-MENA.V,
1-

TAYCO STREET BRIDGE

Location: Tayco Street over the Government Canal
City of Menasha, Winnebago County, Wisconsin

USGS Neenah Quadrangle, Universal Transverse Mercator Coordinates:
Zone 16 Easting 383940 Northing 4894730

Present Owner: County of Winnebago

Present Use: Vehicular

Significance: The Tayco Street Bridge is a double leaf, Strauss Underneath Counterweight bascule bridge. It is significant as the only bridge of this type in Menasha. With its symmetrical design and four houses at each corner, it is also significant as one of only two resources in Menasha built in the Spanish/Mediterranean Revival architectural style.

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Date of erection: 1928-1929[1]

2. Architect: McMahon & Clark Engineering Company[2]

3. Original and subsequent owners: Public ownership.

4. Builders, suppliers:

   A. Builders: Greiling Engineering Company[3]

   B. Suppliers: Unknown

5. Alterations and additions: The south leaf of the bridge collapsed in the 1980s. It was replaced by a fixed steel girder, concrete deck span. This effectively converted the bridge from a double leaf to a single leaf structure. In addition, the original brick deck was replaced with one of metal grating, while the original decorative railings on the

[1]John Jedwabny, "History of Tayco Street Bridge," Menasha Record, 31 August 1929.

[2]Ibid.

[3]Ibid.

walks were replaced with more utilitarian metal railings. As well, the eight original decorative lamp posts, one on each side of the four houses, have been removed. These alterations notwithstanding, the historical integrity of the four bridge houses and the north leaf is excellent.

B. Historical Context:

Bascule Bridges

Moveable bridges today are generally seen as a way to reconcile maritime traffic on a river or channel with the vehicular traffic that needs to cross it. By contrast, early moveable bridges were developed and utilized primarily for defense. The medieval castle with a moat around it used a drawbridge to allow friends in and to keep enemies out. Castles in 14th century France, for instance, operated their drawbridges with chains. Such bridges were effective until cannons were developed that, when aimed well, could break the chains apart and thus allow the bridge to open.[4] As Europe industrialized and settlement in North America expanded, rivers and channels became valuable transportation routes. Water-bound traffic grew as navigation improvements (i.e., the construction of locks and dams) were made. Likewise, the amount of land-bound vehicular traffic needing to cross the waterways increased, especially in the communities adjacent to them. It was this evolving growth in maritime and vehicular traffic that created the need for modern, transportation oriented, moveable bridges.

A wide variety of moveable bridges have been developed through the years, the most prominent types of which are swing, bascule and lift structures.[5] A swing bridge is one that is anchored to a pivot pier placed at its center, while the pivot pier itself is generally located in the middle of the body of water spanned. This type of bridge rotates 90 degrees on the pivot, either opening or closing in the process. Swing bridges are said to "...use of but little, if any, counterweight and with supports to carry the live load at the center and both ends, are of economical design, of simple construction, quick of operation, rigid in service, and would seem to be of ideal design."[6] Bascule bridges, on the other hand, are the successors to the old castle draw-bridges. They are "...hinged at the bank to allow ships to pass under...by raising the part over the river and lowering the part over the bank

[4] W.M. Wilson, "Types of Moveable Bridges," Journal of the Western Society of Engineers 19 (June, 1914): 550-552; Charles S. Whitney, Bridges: Their Art, Science and Evolution (New York: W.E. Rudge, 1929; Reprint, New York: Greenwich House, 1983), 224-227.

[5] Other moveable bridges include the following: Horizontal-Folding Draw, Shear-Pole Draw, Double Rotating Cantilever, Pull Back Draws, Jack-Knife, Gyratory Lift and Aerial Ferries or Transporters. The reader is referred to the following sources for a discussion of these bridge types: Wilson, "Moveable Bridges," 549; J.A.L. Waddell, Bridge Engineering vol. 1 (New York: John Wiley & Sons, Inc., 1925), 664-674.

[6] Wilson, "Moveable Bridges," 551.

behind the hinge."[7] Unlike the old draw-bridges, which utilized unbalanced, chain operated spans, modern bascule bridges employ balanced, mechanically driven spans. The term "bascule" is derived from a French word that means "balance."[8] Lift bridges generally operate as does an elevator. Utilizing two towers, one on each side of a river, the bridge is lifted up through a counter weight system at each corner. The bridge deck remains horizontal throughout the lifting and lowering operation, the intention being to raise the bridge higher than any ship that may need to pass beneath it.

Early nineteenth century moveable bridges were predecessors of the bascule bridge, examples of which were built at Havre, France, in 1824, Selby, England, in 1839 and Chicago, Illinois, in 1834. Bisected by the North and South Branches of the Chicago River, and with many streets needing to cross those rivers, the City of Chicago has been a microcosm in which the evolution of moveable bridges can be studied. After the wooden drawbridge built at Dearborn Street in 1834, the city utilized pontoon bridges from 1840 to 1849 when they were washed out. Thereafter swing bridges were used, the first one being built at Clark Street in 1854. Over time larger ships found it difficult to navigate in the Chicago River, the pivot pier of each swing bridge being located in the middle of the river. Swing bridges, therefore, were replaced by vertical lift bridges and bascule bridges, the first examples of which were built in 1894. The lift bridge, designed by J.A.L. Waddell, was built at South Halstead Street, while the bascule bridge, designed by William Scherzer, was built at Van Buren Street.[9]

Despite the fact that lift bridges were developed about the same time as the bascule, it seems that much attention was focused on swing bridges and bascules -- and which type of bridge was best. Analyzed by authors writing in 1925 [Waddell] and 1943 [Hool, et. al.] it appears that bascule bridges were generally believed to be superior. Both Waddell and Hool agree that the bascule bridge offers the following advantages over the swing bridge:

1. The bascule can generally operate faster since the degree of operation can be tailored to the size of the craft passing. A swing bridge must open its full 90 degrees regardless of the size of the vessel.

2. The swing bridge takes longer to complete its cycle than does a bascule, even when both are fully opened, because a craft must stand far enough away from the bridge to clear its swing. Once opened then, the

---

[7]John S. Scott, A Dictionary of Civil Engineering (Baltimore: Penguin Books, Inc., 1958; Revised, 1965), 27.

[8]Waddell, Bridge Engineering, 700.

[9]Ibid.; Ellis L. Armstrong, ed., History of Public Works in the United States, 1776-1976 (Chicago: American Public Works Association, 1976), 113-114; Wilson, "Moveable Bridges," 561-583.

bridge can not close until the vessel has cleared the swing radius on the side exited. With a bascule bridge a craft can advance right up to the structure, which can then be lowered as soon as the craft passes.

3. A bascule bridge requires that no piers be placed in the river, thus one large opening is available for navigation instead of the two small ones provided by a swing bridge. Larger vessels, consequently, can navigate waterways with bascule bridges.

4. Without the pivot pier, bascule bridges also present fewer navigation hazards. There is less chance of a collision and any resulting damage to the bridge or the passing vessel.[10]

In addition to these four advantages, Hool suggests that bascule bridges are safer than swing bridges because they offer a barrier to traffic when opened. This is especially true with a double leaf bascule since it provides an obstruction to traffic on each side of the river when open (a single leaf bascule would only provide a barrier on one side).[11] Waddell further suggests that bascules are better than swing bridges because the lack of a pivot pier promotes the freer flow of water and less chance for sand build up (an additional navigation hazard) around the pier.[12]

While Waddell and Hool agree that bascule bridges are superior to swing bridges, they disagree when comparing bascule bridges to vertical lift structures. Waddell argues that lift bridges are less susceptible to the wind, are more rigid in the down position, are more easily disassembled and moved, are cheaper to build and do not have to open as far as does a bascule for small craft.[13] Hool suggests that the bascule is better because it provides at least one, and two if its a double leaf structure, barrier to approaching traffic. The vertical lift, Hool observes, offers none.[14]

Despite the fact that more and more vertical lift bridges were built as the twentieth century progressed, bascule bridges succeeded swing bridges as the moveable bridge of choice. Scherzer's Van Buren Street bridge and London's Tower Bridge, also completed in 1894, are regarded as the first

---

[10]George A. Hool, et. al. eds., Moveable and Long-Span Steel Bridges (New York: McGraw-Hill Book Company, 1943), 1-5; Waddell, Bridge Engineering, 680-682.

[11]Hool, et. al., Steel Bridges, 1-5.

[12]Waddell, Bridge Engineering, 680-682.

[13]Ibid., 682.

[14]Hool., Steel Bridges, 5.

modern bascule bridges.[15] It was from those two bridges that all other types of bascules evolved.

There are four major types of bascule bridges and several minor types. The major types include Scherzer, Rall, Strauss and Chicago bridges. The Scherzer and Rall structures are rolling lift bridges where the structure's center of gravity actually moves back as the bridge opens. In contrast, the Strauss and Chicago types are trunnion bridges that have a fixed pivot point near the span's center of gravity. Key to all bascule bridges is the existence of a counterweight that balances the moveable leaf. Less frequently used types of bascule bridges include Brown, Page and Waddell & Harrington structures.[16]

Scherzer bridges utilize trusses with ends, or heels that are 90 degree arcs, the center point of which is the span's center of gravity. As the bridge opens, generally utilizing a rack and pinion drive, it rolls back on the arc and a track anchored to the abutment. In this system the center of gravity moves back in a horizontal line as the leaf opens; it does not pivot. A pit is needed to accommodate the counterweight that balances the structure as it opens.[17] The Rall bascule bridge utilizes a rack and pinion system, as does the Scherzer. The significant difference, however, is that, as the Rall rolls back, it moves on rollers that are placed at its center of gravity. With the Scherzer bascule, the center of gravity is a distance equal to the arc's radius above that place where the arc and track make contact.[18]

Chicago style bascule bridges are also known as "simple trunnion" bridges. In this case a trunnion refers to the fixed point at which the structure pivots, and in Chicago style bridges there is only one such point. Unlike Scherzer and Rall bridges, consequently, the center of gravity in a trunnion bridge does not move. Developed by the City of Chicago Bridge Department, "...the entire weight of the leaf and counterweight during the operation of opening is carried by the trunnions [pivot point and pins]...located approximately at the center of gravity of the mass [span]. These trunnions are carried in trunnion bearings which in turn are supported directly or indirectly on the masonry of the pier." Chicago style bridges are counterbalanced by a weight fixed tightly to the land end of the span. A pit is needed to accommodate the weight as the bridge opens [see Figure 1].[19]

---

[15]Waddell, Bridge Engineering, 701; Hool, et. al., Steel Bridges, 1.

[16]These bridges are discussed at some length in: Waddell, Bridge Engineering, 709-714, 714-715. Referred to with slightly different names, the cable lift bascule, the rolling counterweight bascule and the semi-lift bascule are all discussed in: Hool, Steel Bridges, 8-9, 13, 25-26.

[17]Hool, et. al., Steel Bridges, 15, 16; Wilson, "Moveable Bridges," 561, 563.

[18]Hool, et. al., Steel Bridges, 17-19; Wilson, "Moveable Bridges," 565.

[19]Hool, et. al., Steel Bridges, 19-21; Wilson, "Moveable Bridges," 576; Waddell, Bridge Engineering, 708-709.

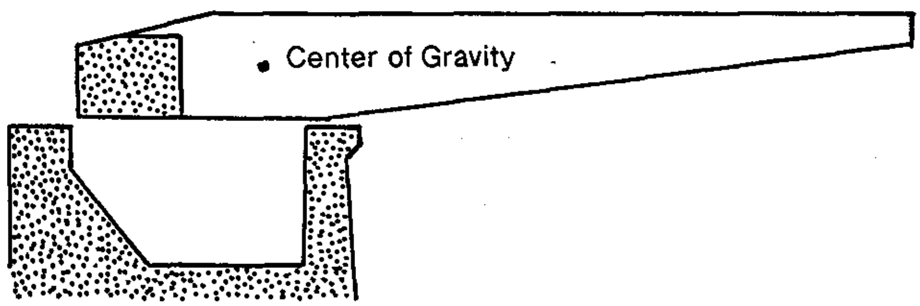

FIGURE 1: CHICAGO STYLE, SIMPLE TRUNNION BASCULE BRIDGE[20]

[20]Diagram redrawn from Hool, et. al., Steel Bridges, 20.

Strauss bascule bridges were developed by Joseph B. Strauss, a prominent engineer who was born in Cincinnati in 1870. Studying at the University of Cincinnati, Strauss received his degree in civil engineering in 1892, after which he taught at the University for a time. Strauss worked for the Lassig Bridge and Iron Company, Chicago, as an estimator and designer from 1895 to 1897, and then the Sanitary District of Chicago as a designer and squad boss from 1897 to 1899. He founded the Strauss Bridge Company shortly after the turn of the century, a company he served as the president and chief engineer. Joseph Strauss was responsible for several bridge design innovations. He developed the Cantilever-Suspension bridge, "...a structure which combines the principles of the Cantilever and Suspension bridge, making possible a length of span equal to the combined maximum obtainable in each." That innovation made possible the construction of San Francisco's Golden Gate Bridge, a project upon which Strauss served as chief engineer.[21] He also created the Strauss bascule bridge, a structure that eliminated the need for a counterweight pit by incorporating multiple trunnions instead of just one. This innovation made bascule bridges more adaptable to locations where, for any number of reasons, it was not practical to build a pit sufficient to accommodate the counterweight when the bridge was open.

The key to the various types of Strauss bascule bridges is the fact that the counterweight pivots. According to Waddell, "the distinctive feature of the Strauss trunnion bascule is the pivoting of the counterweight at the end of the shore arm [the land end of the moveable leaf]. This enables the said counterweight to move parallel to itself at all times; and it can, therefore, be made in such shape that no pit is required to receive it when the leaf is in an upright position."[22] More specifically, W.M. Wilson, a structural engineering professor at the University of Illinois, wrote that "the counterweight is connected to the moving leaf by means of a parallelogram [with trunnions at two corners and link pins at the remaining two] whose sides are steel members hinged at the intersection point. The use of this parallelogram eliminates the necessity of having the center of gravity of the counterweight on a line through the center of gravity of the moving leaf and the center of the trunnion."[23] In other words, since the counterweight moves parallel to itself, the force it exerts is always perpendicular to the ground. The force can also be focused on one point. In the case of the Strauss bascule, the force is focused on the counterweight trunnion, that point behind the main trunnion where the weight of the span is balanced. This eliminates the need to have a rigidly fixed counterweight on the heel of the bridge since the vertically delivered force on the counterweight trunnion serves the same balance function as the counterweight itself.

---

[21]Who's Who in Engineering (New York: American Association of Engineering Societies, 1925), 2018; Who's Who in Engineering (New York: American Association of Engineering Societies, 1937), 1338.

[22]Waddell, Bridge Engineering, 704-706.

[23]Wilson, "Movable Bridges," 581.

These principals affected bascule bridge design in two particular ways. First, the counterweight no longer had to be rigidly attached to the heel of the span, thus allowing for its placement elsewhere on the structure. And second, with the counterweight's move away from the heel, the structure's center of gravity moved from the main trunnion, or pivot point, to a point more toward its center. To effectively pivot, however, one side of the parallelogram must be that line between the main trunnion and the counterweight trunnion (the pivot point at which the counterweight is exerted upon the span). The counterweight trunnion/main trunnion line also passes through the structure's center of gravity, thereby assuring a properly balanced bridge [see line DAE, Figure 2].

There are three types of Strauss bascule bridges: the Overhead, Heel and Underneath Counterweight. The primary difference between them is the location of the counterweight itself. The Overhead bridge incorporates a tower-like structure that supports the counterweight, which is located immediately above the span's heel [see Figure 2]. In the Heel bridge, part of the structure extends above and behind the heel of the bridge. It is that part of the structure that supports the counterweight [see Figure 3]. The third type of Strauss trunnion bridge is the Underneath Counterweight. With this type of structure, the counterweight is hung from the heel of the bridge instead of above it [see Figure 4]. A pit is needed for the counterweight, consequently, just as it is for the Chicago type. Hool, et. al., notes that "this arrangement is particularly adapted to locations which provide ample clearance between high water level and grade."[24] Underneath Counterweight bridges also appear to be well suited to those sites where there is not enough room for the shore arm to extend its full length with the rigidly attached counterweight. Such a situation might be created by buildings that are too close to the bridge foundation. The Underneath Counterweight, however, because the counterweight hangs from the heel and pivots, does not need the clearance that a Chicago style bridge would. It is logical to conclude, therefore, that it can be built in tighter quarters.

Of the bascule bridges discussed, Scherzer bridges were thought in 1943 to be the most popular type, followed, in order, by the various forms of the Strauss, the Chicago and the Rall.[25]

Despite the characteristics that differentiate bascule bridges, there are certain general considerations that affect them all. One factor is the operator's house. It must be situated to the side of the structure, either at street level or above, in such a fashion that a view of the channel can be maintained. The house should offer at least an 8' x 12' (96 square feet) work area, while its appointments should include a hand brake, switch

[24]The underneath counterweight appears to be the lesser used of the three Strauss bascule bridges. Hool mentions it in a sbort paragrapb but offers no diagram, and Wilson provides a diagram but does not discuss the type. Hool, et. al., <u>Steel Bridges</u>, 19, 24-25; Wilson, "Moveable Bridges," 580-582.

[25]Hool, et. al., <u>Steel Bridges</u>, 38.

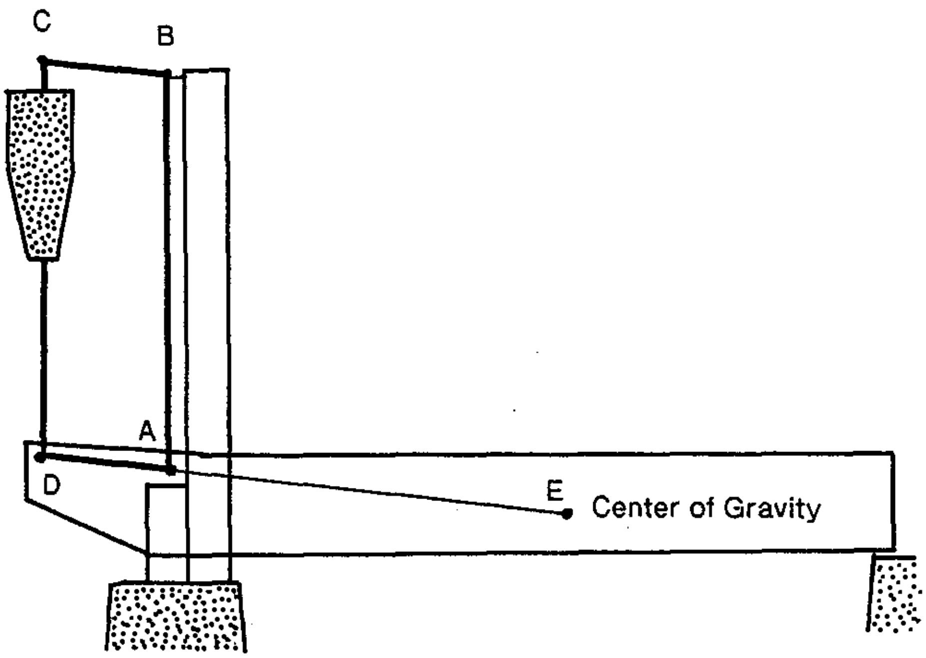

FIGURE 2: OVERHEAD COUNTERWEIGHT BRIDGE[26]

[26]Diagram redrawn from Wilson, "Moveable Bridges," 580.

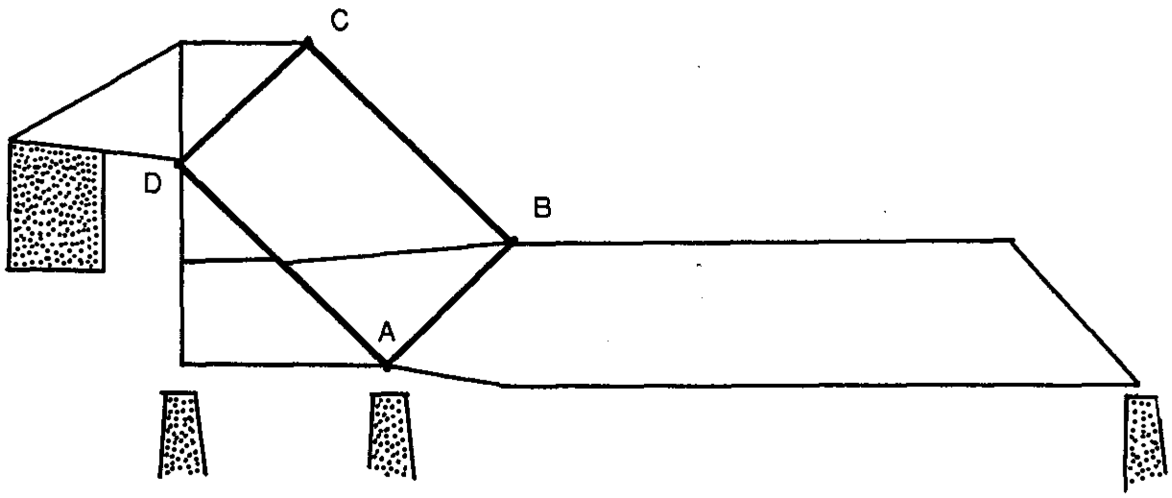

FIGURE 3: HEEL COUNTERWEIGHT BRIDGE[27]

[27]Ibid.

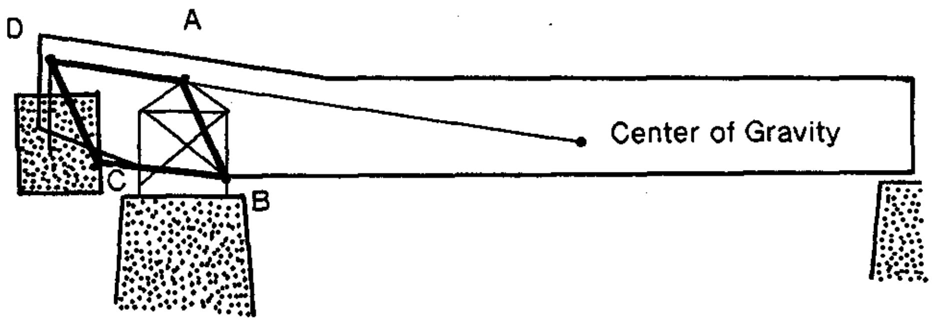

FIGURE 4: UNDERNEATH COUNTERWEIGHT BRIDGE[28]

[28]Ibid.

board, desk chairs, gauges and heat. One operator's house is all that is needed to facilitate operation; however, if architectural design and balance are concerns, a house can also be placed at each corner of the structure. If four houses are utilized, it has been suggested that the second could be reserved for the operator's quarters while those remaining could be used for storage.[29] Another factor with which to deal is the power source. Early moveable bridges were powered by hand. Structures in Europe were subsequently hydraulically powered, while those in the United States used steam. Finally, electricity was adapted to moveable bridges. Wilson suggested that "the ease with which it [electricity] can be transmitted to any desired point and its property of being instantly available with no consumption of energy when no work is being done, make it superior to other kinds of power for locations near a source of continuous supply."[30] Waddell corroborates the choice of electricity as being best for bridges. He continues that if electricity is not available a gas engine should be considered. As well, if electricity is available from only one source, a gas engine should be kept as an auxiliary source of power. He noted that all bridges should facilitate hand operation, just in case all sources of power fail.[31]

Additional considerations common to all bascule bridges include whether double leaf or single leaf spans should be utilized, determining the amount of counterweight needed and assuring that counterweight pits are constructed properly -- if indeed a counterweight pit is needed. As far as the double span/single span factor is concerned, double span bridges are thought to have the following advantages:

1. They are safer since they can block traffic from both directions.

2. Their two leaves are shorter and lighter than one large, long leaf. Less weight means less strain on the operating machinery, less wind resistance, less counterweight material needed over all, and shorter spans mean faster operation.

3. They are more balanced and aesthetically pleasing.

4. Greater headroom is provided at the center of the channel, thereby permitting easier passage of small craft.[32]

---

[29]Hool, et. al., Steel Bridges, 69-71.

[30]Wilson, "Moveable Bridges," 553.

[31]Waddell, Bridge Engineering, 678-679.

[32]Hool, et. al., Steel Bridges, 30-32.

Single leaf bridges, by contrast, are able to consolidate their machinery and central power controls in one location. As well, only one counterweight pit is needed.[33]

Counterweight considerations are centered on the fact that each bridge span must be balanced. The only stress on a structure's machinery should be inertia, friction and wind - none should be present due to an improperly balanced span. Since there can be a 2-3% weight variance due to weather changes, a counterweight should have pockets in it that can be filled with, or emptied of, weight blocks as needed to maintain balance. Concrete is the most common type of material used for counterweights, while cast iron is second. And finally, for bridges with counterweight pits, the pit is essentially the structure's foundation. Accordingly, special attention must be paid to them. They must be watertight, and reinforced for outward and inward pressure, as well as have pumps to remove any water that does get in. They should also have buffer blocks that absorb any shocks or impacts created by the bridge's operation that might otherwise be transmitted to, and perhaps crack the walls.[34]

Tayco Street Bascule Bridge

The Tayco Street Bridge is a Strauss, Underneath Counterweight bascule bridge. It is a double leaf structure that is powered by electricity, and has an emergency, hand operated mechanism as well.[35] A prominent Menasha landmark, the bridge has four houses, one at each corner. They were designed in the Spanish/Mediterranean Revival style and, collectively, constitute only one of two resources in the City of Menasha that utilizes that style.[36] The house in the southeast corner contains the bridge operator's office on the first floor and the control room on the second. The control room has a clear and unobstructed view of vehicular traffic on the bridge, as well as maritime traffic on the channel. It has approximately 178 square feet of work space. The house in the northeast corner is used for storage, while the northwest house contains what once was a public men's restroom, now used only by the bridge tenders. The southwest house contains a women's public rest-room. The bridge's counterweight is concrete and there are no apparent ways to adjust its weight.

Although the reasons that a Strauss Underneath Counterweight structure was selected for the site are not clear, it is quite possible that commercial

---

33 Ibid., 32-33.

34 Ibid., 39, 53-57, 64-65.

35 Actually, the bridge was a double leaf structure. Several years ago the south leaf collapsed into the river. It was replaced with a fixed steel beam, concrete deck span. Only the north leaf operates now, essentially making the bridge a single leaf structure.

36 Peter J. Adams, et. al., Menasha Intensive Survey: Final Report (Menasha: City of Menasha, 1986), 14.

development to the north, and industrial development on the south, made the site too tight for a Chicago style bridge to effectively operate. An Overhead likely could have worked at this site, but, given the architectural nature and design of the structure built, it is clear that the Overhead would not have been appropriate for the location. This rationale suggests, therefore, that the Underneath Counterweight was a logical choice for the site.

History of the Tayco Street Bridge

The Lower Fox River is broken into two channels as it flows from Lake Winnebago into Little Lake Buttes des Mortes. Between the channels is Doty Island. The north channel provides the focus around which the City of Menasha grew, while the City of Neenah grew around the south channel. The boundary between the two cities divides Doty Island approximately in half.

Menasha's first settlers were former Territorial Governor James Duane Doty and his son Charles. Although Governor Doty bought the land upon which they settled in 1835, after the Menomonee Indians yielded their rights to it, he did not move there until 1845. He lived on Doty Island, and apparently had some interest in helping to develop Neenah, the first of the two communities to be established. Some questions arose over who had the right to develop the water power on the channel, however, so the Dotys and Curtis Reed withdrew and focused their activity on the north channel in 1848.[37]

The foundation for Menasha's growth had been laid well by 1850. A dam had been built, the government canal (part of the Fox-Wisconsin Waterway project) had been promised and the fledgling town had been platted. As well, the elder Doty had been elected to congress. His Washington connections no doubt contributed to the Government Land Office's 1851 move from Green Bay to Menasha and the 1852 funding of a light house - a significant factor as the town tried to attract the growing Lake Winnebago steamship traffic to its shores.[38]

Growth occurred rapidly. Industrial development began with the five sawmills that started operating in the town between 1848 and 1851. The town's mercantile trade grew as plank roads were built to Appleton and Kaukauna, people arrived to make purchases at the Land Office and steamship traffic began to increase. By 1855, Menasha had three commercial districts, one of which was at Tayco and Water Streets, immediately adjacent (to the north) to the present Tayco Street bridge. By 1860, Menasha's population was 1,436.[39]

[37]Ibid., 14; History of Northern Wisconsin (Chicago: Western Historical Company, 1881), 1168.

[38]Adams, Menasha, 14; Northern Wisconsin, 1170.

[39]Adams, Menasha, 14-15, 87, 99.

Manufacturing and shipping related commerce were the primary activities that fueled Menasha's continuing growth. Population reached about 2,800 by 1870, and 3,144 by 1880. In the last twenty years of the nineteenth century, several new industries located in Menasha, among which were the Whiting Paper Company in 1882, the Gilbert Paper Company in 1887 and the Strange Paper Company and Menasha Wood Split Pulley Company, both in 1888. The arrival of this new industry was evident in the city's population. It grew to 4,581 in 1890 and 6,145 in 1895.[40]

Located immediately to the south of the Tayco Street Bridge, the Strange Paper Company included several brick buildings that were built in 1889. Incorporated and capitalized at $100,000.00 in 1891, the company moved into print paper production. Despite a short time in which John Strange lost control of his company, due to the Panic of 1893, he operated the company until he died in 1923. The company remained in the family until 1945, after which it was sold. The Menasha Corporation bought the mill in 1969 and the U.S. Paper Mill Corporation bought it in the mid-1980s.[41]

Menasha's location on the Fox River's North Channel meant that bridges were needed to facilitate passage from one side of the city to the other. Accordingly, the first bridge was built at Tayco Street and Washington Street in 1851. It was replaced by a wooden bridge in 1882 and again by a modern structure in 1920. The city's second bridge was built across Little Lake Butte des Morts in 1853. Replaced by a pontoon bridge in 1856, and a pile bridge in 1861, this structure deteriorated and is thought to have burned at some time in the 1880s. Other bridges were also built between Naymut Street and Main Street. The first one was constructed in 1855, across the dam located there. Enlarged when the dam was subsequently rebuilt, part of that bridge collapsed in 1896. It was reconstructed. Also built in the Naymut/Main Street area were bridges across the Government Canal and the Lawson (industrial) Canal. These bridges and their successors were later replaced by the Racine Street Bridge.[42]

Another Menasha bridge was the one built across the Government Canal at Tayco Street, immediately north of the Tayco Street/Washington Street Bridge over the North Channel. The structure, a pontoon bridge, was built in 1859 by Henry Hewitt, Sr. It was replaced when the canal was enlarged in 1867, and replaced again in 1886. That bridge was a swing bridge, built by the Milwaukee Iron Bridge Company at a cost of $7,500.00.[43] Erected prior to the advent of the automobile, the 1886 bridge served the community for about forty years.

---

[40]Ibid., 17, 87.

[41]Ibid., 111.

[42]Ibid., 182-184.

[43]Ibid., 182.

By 1920, the Tayco Street Bridge could no longer adequately handle automobile traffic, the volume of which had increased substantially after State Highway 15, now U.S. Highway 41, was rerouted over it. Although the old swing bridge created a navigable passage sixty feet wide, the War Department insisted that a channel at least 100 feet wide had to be maintained. Since that type of clearance was impossible for a swing bridge to achieve, given the nature of the site, it meant that either a lift bridge or bascule bridge would have to be built. The city hired the McMahon & Clark Engineering Company in early 1924 to survey the site and to draft plans for a new bascule bridge. A major obstacle to the bridge's construction arose, however, when it became evident that no state aid would be available to help fund construction. The project appeared to be dead since the city could not finance the new bridge on its own.[44]

State Senator Merritt F. White resurrected the plan in 1926, though, when he proposed an amendment to the existing state law. He wanted to require the state and counties to pay for the majority of public improvements. In July 1927, the Menasha common council petitioned the Wisconsin Highway Commission for aid in rebuilding the Tayco Street Bridge. A public hearing was held on October 13, during which city officials and interested citizens convinced the Highway Commission to support the project. The city called for bids which were opened on June 29, 1928. The contract, which totaled $217,166, was awarded to the Greiling Engineering Company of Green Bay. Before work for the new bridge could start, the bridges on Mill Street had to be reinforced to handle the heavy traffic diverted from Tayco Street. The old Tayco Bridge was finally closed to traffic on September 4, 1928 and dismantled.[45]

The project was originally slated to be completed in June 1929, but severe weather hampered construction during the winter. Fair weather in the spring, however, enabled workers to make up for lost time. While construction progressed, Mayor W. E. Held and interested citizens launched a move in April to designate the bridge a memorial for Menasha's veterans. Although the city council unanimously approved the measure, the issue was not clear cut. The State Highway Commission had already purchased tablets for the bridge, without any mention of a memorial, at a cost of approximately $140. The issue boiled down to who would pay for alterations in the tablets. Although Menasha's American Legion offered to pay the cost, the city council declined because "the city had promised much more to her soldiers and sailors of past wars."[46]

Under the direction of chief engineer Walter J. Gunther, work on the bridge seemed to be on schedule. But in early June the receipt of defective

---

[44]Jedwabny, "Tayco Street Bridge."

[45]Ibid.

[46]"Making Bridge a Memorial," The Menasha Record, 17 April 1929, 1.

heavy bearings and labor unrest in the steel industry conspired to bring construction to a standstill. The halt was short lived, and one week later steel crews were putting the structural steel in place. The heaviest pieces weighed more than fifteen tons and were positioned by a derrick operated from a barge anchored in the canal.[47] In July, work began on the street intersections and the approaches to the bridge. F. Zemlock and Son of Neenah were contracted to install a sewer across Tayco Street at Water Street. Meanwhile the stone work for the bridge tender's station and one of the comfort stations was underway. The spans of the bridge were assembled in an upright position, but they had to be lowered before the floor could be laid. The southern span was lowered for the first time on July 25.[48]

By early August, the project's end was near. On August 8, the City Council, after a "lively contest," selected Joseph Muntner as Chief Operator of the new bridge. He was to go on duty immediately with a salary of $135 per month. Gustave Herman was chosen as First Assistant Operator, receiving a salary of $100 per month, and serving only during the bridge's open season.[49] The next evening, a meeting of Menasha retail merchants was held to aid the city council committee in charge of arrangements for the bridge's dedication. Final plans for the bridge's August 31 opening were announced on August 20.[50]

The completed bridge was impressive. The final cost was $260,000. It had a span of 102 feet, a roadway forty feet wide, and two eight foot wide sidewalks. One house was placed at each of four corners of the bridge, one serving as a bridgetender's station, two used for public comfort stations, and the last was used as a storehouse. The houses were decoratively designed.[51] The dedication ceremony was an elaborate affair. The program began at noon on August 31. Wisconsin Governor Walter J. Kohler arrived at Whiting Airport at 12:30 and was escorted to the "loop" district of Menasha (at the triangle at Main, Tayco, and Kaukauna Streets) by a committee led by Mayor Held. Congressman Florian Lampert, State Senator Merritt F. White, and other local officials joined the Governor at the speaker's stand. Governor Kohler gave a short address, and then Marshall A. Graff, recently elected commander of Wisconsin's Foreign Legion, accepted the bridge in the name of the Legion and dedicated the

[47]"Bridge Work at Standstill," The Menasha Record, 8 June 1929; "Placing Steel at New Bridge," The Menasha Record, 13 June 1929.

[48]"Pavement at New Bridge," The Menasha Record, 8 July 1929; "Tayco Street Bridge Closed," The Menasha Record, 26 July 1929.

[49]"Council Names Two Bridge Men," The Menasha Record, 8 August 1929.

[50]"Merchants to Aid in Big Fete at Opening of Tayco St. Bridge," The Menasha Record, 9 August 1929; "Plans Go Forth for Dedication of Menasha's New Bridge Aug. 31," The Menasha Record, 20 August 1929.

[51]Jedwabny, "History of Tayco Street Bridge."

bridge to public service. Graff noted that it was "highly desirable that we recall the spirit of our soldier dead and it is peculiarly appropriate that a memorial to the dead of the late war be a splendid structure of every day service to the old home town...."[52] Over 15,000 people attended the afternoon festivities. They were treated to music by the St. Mary and Menasha high school bands and the Legion-Eagle drum corps. An airplane dropped flowers over the crowd at the height of the ceremony, and a parade, consisting of National Guard units, the American Legion posts of Menasha, police officers, and Boy Scouts, streamed past the speaker's platform.

The program continued into the evening. A banquet was held at the Hotel Menasha at 6:30. One of the highlights of the banquet was Alderman T. E. McGillan's announcement that United States Senators John J. Blaine and Robert M. LaFollette, Sr., had telephoned to offer their congratulations to the city. Later in the evening, an orchestra played for a "pavement" dance. The festivities officially concluded at midnight when Ethel Held, daughter of the mayor, cut the ribbons to the bridge. A car carrying the mayor and members of the city council was the first to cross, but a steady stream of motorists passed over the bridge from that hour throughout the following Labor Day. Since that day, the Tayco Street Bridge has served Menasha for over sixty years.[53]

PART II. ARCHITECTURAL INFORMATION

A. General Statement:

1. Architectural Character: The Tayco Street Bridge was built in 1928-1929. It is a Strauss Underneath Counterweight bascule bridge. The structure's sense of balance and design is greatly enhanced by its four houses, one at each corner. Collectively, the houses create a fine example of the Spanish/Mediterranean Revival architectural style adapted to an industrial artifact.

2. Condition of fabric: The integrity of the four houses, as well as the north leaf and its operating machinery, is good. The south leaf collapsed several years ago and has been replaced by a fixed, steel girder and concrete deck span. As well, the original brick deck was replaced with one of open, metal grating and the decorative walkway railings were replaced with ones of non-descript, metal vertical and

---

[52] "Accepts Bridge in Name of the American Legion," The Menasha Record, 31 August 1929; "Gov. Kohler at Dedication," The Menasha Record, 31 August 1929.

[53] "Plans Go Forth for Dedication of Menasha's New Bridge Aug. 31," The Menasha Record, 20 August 1929; "One Week to the Bridge Dedication," The Menasha Record, 24 August 1929; "Expect 20,000 at Bridge Dedication Here Saturday," The Menasha Record, 27 August 1929; "Accepts Bridge in Name of the American Legion," and "Gov. Kohler at Dedication," The Menasha Record, 31 August 1929; "New Bridge Now Open to Traffic," The Menasha Record, 3 September 1929.

horizontal members. Eight decorative lamp posts, one on each side of the four houses, have also been removed. The bridge is scheduled for replacement in early 1993.

3. Summary Description: Rising from reinforced concrete foundations and counterweight pits, the Tayco Street Bridge has two distinct elements. The first is the bascule piers, one on each side of the canal, that contain the counterweight pits and the houses that sit atop them. The second element consists of the actual bridge leafs.

Each counterweight pit contains the operating machinery for the leaf attached thereto. Machinery includes the electric motor, main drive shaft, step-up gears, and the gears that drive the bascule girders. Structural elements in each pit include the counterweight, the counterweight trunnion, the main trunnion, the trunnion girder, the heels of the bascule girders and the trunnion posts. Atop each counterweight pit are two houses that project over the river and flank the road. The houses are two story, octagonal structures that were built in the Spanish/Mediterranean Revival architectural style. With ashlar limestone sheathing and red tile roofs, the four houses create a nicely balanced, symmetrical structure. The house in the southeast corner contains the operator's office.

The bridge has two leafs. Originally a double leaf, bascule bridge, the south leaf collapsed some years ago and was replaced by a fixed steel girder and concrete deck span. The north leaf, nevertheless, is a bascule leaf that is structurally tied to the counterweight pit, the main trunnions and the counterweight trunnions through the bascule girders.

B. Description of Exterior:

1. Overall dimensions: The bridge is approximately 165 feet 6 inches long from gate to gate. As it was originally built, it was 125 feet long from center of the main trunnion to center of the main trunnion, dimensions that created a 100 foot wide clear channel.[54] The overall width of the span is 52 feet, while the width between bascule girder centers is 43 feet. The clear roadway width is 40 feet.

2. Foundation: The overall dimensions of each bascule pier are 89 feet by 32 feet 6 inches. The floor of the pier is approximately 6 feet thick, while the walls are 4 feet thick at the bottom and taper to 1 foot 6 inches at the top of the river side and 2 feet 6 inches at the top of the land side. The main cavity of the pier (the counterweight pit) is about 48 feet by 21 feet (at its base). It is approximately 25 feet 4.5 inches deep.

[54]Note that the 100 foot clear channel was lost when piles had to be driven to receive the river end of the new, concrete deck south span. There are now two 50± foot clear channels.

At each end of the bascule piers is a small shelf. These shelves, which are 10 feet 3.25 inches long, 13 feet 4 inches wide and about 9 feet 5 inches deep, provide the foundation for the four houses that are part of the overall structure. The floor of each shelf, which is 3 feet 5.25 inches thick, is 14 feet 1 inch above the floor of the counterweight pit. The shelves are supported on the road side by the bascule pier wall, and on the opposite side by concrete cylinders, one at each corner, that sit on bedrock. The cylinders are 4 feet in diameter and about 8 feet long.

The bascule piers and the shelves attached thereto are all constructed of concrete reinforced with steel bars.

3. Structural System: The main structural elements of this bridge are the trunnion piers, the trunnion girder, the bascule girders and the floor beams.

Built in pairs to support each of the bridge's four original trunnions, the trunnion posts, which are 27 feet 2 inches tall, are fabricated from two 40 pound, 15 inch channels and 2.75 inch wide flat iron double lacing. Behind the trunnion posts are subordinate posts that are just over 16 feet tall. They are fabricated from two 45 pound, 15 inch channels, 4 inch by 4 inch angles, 3.5 inch by 3.5 inch angles and 2.75 inch wide flat iron lacing. Utilized as a buttress, the subordinate posts are tied to the main trunnion posts through a combination of members, some of which are fabricated from two 25 pound, 12 inch channels and 2.75 inch double lacing, while others are comprised of 5 inch by 3.5 inch angles with 2.75 inch double lacing. A 23 foot 1.75 inch tall side buttress also supports each trunnion post pair. Its main vertical element is constructed from two, 5 inch by 3.5 inch angles and 2.75 inch wide flat iron double lacing. The diagonal members, that tie the buttress to the main posts, are built of two, 3.5 inch by 3.5 inch angles with 2.75 inch double lacing.

The trunnion girder is about 7 feet 6 inches high. Its top chord is fabricated from two 12 inch, 30 pound channels and 2.75 inch double lacing, while the bottom chord is constructed of two, 40 pound, 15 inch channels. The vertical members of the girder, as well as the diagonal members at its center, are built from two 5 inch by 3.25 inch angles with 2.75 inch wide flat iron double lacing. The diagonal elements that are closest to the trunnion posts are built of two 12 inch, 25 pound channels with 2.75 inch double lacing. The remaining diagonal members of the this girder are comprised of four 5 inch by 3.5 inch angles with 2.75 inch double lacing.

The bascule girder is 77 feet 6.125 inches long [15 feet behind the center of the main trunnion and 62 feet 6.125 inches from the center of the main trunnion to the end of the span]. At its widest point, just to the river side of the main trunnion, the girder is 10 feet 6.5

inches wide. It tapers on both sides then, until it is 6 feet 6.5 inches wide at the river end of the span.

The thickness of the angles and stay plates varied between .375 inch and .437 inch.

Each span had five floor beams. The first beam is 7 feet to the river side of the trunnion. The remaining four beams are placed on 13 foot 3 inch centers. Beams one, two and three are 3 feet 6.25 inches high. The top and bottom chords of these beams are fabricated from two 6 inch by 6 inch angles. Beams four and five are 2 feet 10.25 inches high. Their top and bottom chords also utilize two 6 inch by 6 inch angles. Located at the same positions as the floor beams, but on the opposite side of the bascule girders, are 9 foot to 9 foot 6 inch wide tapered brackets that support the bridge's sidewalks. The floor beams support fifteen deck stringers. Stringers one and fifteen are placed on 1 foot 6 inch centers inside the bascule girders. Stringers two through six, and ten through fourteen are all placed on 3 foot centers, while stringers seven, eight and nine are placed on 2 foot 6 inch centers. The deck stringers appear to be rolled, "I" beams. The bottom lateral bracing between deck beams one and two are comprised of elements built from two 6 inch by 4 inch angles, two 3.5 inch by 3.5 inch angles and one 3.5 inch angle. The bracing between beams two and three, and three and five consists of single 3.5 inch by 3.5 inch angles.

The bascule pier deck is supported by 18 inch, 54.7 pound "I" beams.

The deck of the fixed, concrete south span is supported by six 36 inch by 16.5 inch stringers, that are placed on 11 foot centers.

4. Openings: This category applies to the four houses that sit atop the bridge. The first floor windows on the octagonal structures are 4 feet 2 inches by 2 feet 6 inches. A window is centered in each wall surface, except that one immediately facing the road. A 7 feet 4 inch by 2 feet 10 inch door is centered in that plane. Second floor windows appear to be the same size as those on the first, except that each has a 10 inch high transom. One is centered in each of the eight wall surfaces.

5. Roof: Each house has an eight plane roof with gently pitched slopes that rise to a shallow peak. The roof is covered with flat red tile, while the eaves and highly ornamented cornice are terra cotta. With its alternating scallops and lion heads, the decorative cornice hides the copper rain gutters from view.

C. Description of Interior:

1. Floor Plans: The houses in the northeast, northwest and southwest

all have unfinished second floors. The two houses on the west side of the structure were completed as public restrooms, and the north-east house was generally used for storage.

The only house with a describable floor plan is the one in the south-east corner. Used as the operator's office, the lower floor is open and reflects the octagonal shape of the house. The upper floor is also open and contains the bridge's control and operator's panel.

2. Stairways: The most commonly used stairway in the bridge structure is the one between the first and second floors in the operator's house. It has four steps, the fourth of which is a small landing/turn, and then seven more steps to the second level. The stairs have a 1.25 inch pipe railing. Stairs in both east side houses also permit access to the counterweight pits and the machinery found therein.

3. Mechanical Equipment: The bridge's control panel was manufactured by Cutler Hammer, Milwaukee.

C. Setting:

The bridge is located in the City of Menasha, at that point where Tayco Street crosses the Government Canal. It is oriented on a North/South axis. The area south of the bridge is generally industrial. Immediately adjacent to the south end of the bridge is the old John Strange Paper Company mill complex. The area is a little more open than it was when the bridge was built because one of the mill buildings has been demolished. There are also several railroad crossings at this end of the bridge, since tracks were laid to service the various mill buildings.

Although the two commercial buildings that were immediately next to each of the houses on the north side of the bridge have been demolished, an old commercial district is adjacent to the north end of the bridge.

PART III. SOURCES OF INFORMATION

A. Bibliography:

1. Primary and unpublished sources: None

2. Secondary and published sources:

"Accepts Bridge in Name of the American Legion." Menasha Record, 31 August 1929.

Adams, Peter J., et. al. Menasha Intensive Survey: Final Report. Menasha: City of Menasha, 1986.

Armstrong, Ellis L., ed. History of Public Works in the United States, 1776-1976. Chicago: American Public Works Association, 1976.

"Bridge Work at Standstill." The Menasha Record, 8 June 1929.

"Council Names Two Bridge Men." Menasha Record, 8 August 1929.

"Expect 20,000 at Bridge Dedication Here Saturday." Menasha Record, 27 August 1929.

"Gov. Kohler at Dedication." Menasha Record, 31 August 1929.

History of Northern Wisconsin. Chicago: Western Historical Company, 1881.

Hool, George A., et. al., eds. Moveable and Long-Span Steel Bridges. New York: McGraw-Hill Book Company, 1943.

Jedwabny, John. "History of Tayco Street Bridge." Menasha Record, 31 August 1929.

"Making Bridge a Memorial." Menasha Record, 17 April 1929.

"Merchants to Aid in Big Fete at Opening of Tayco St. Bridge." Menasha Record, 9 August 1929.

"New Bridge Now Open to Traffic." Menasha Record, 3 September 1929.

"One Week to the Bridge Dedication." Menasha Record, 24 August 1929.

"Pavement at New Bridge." Menasha Record, 8 July 1929.

"Placing Steel At New Bridge." Menasha Record, 13 June 1929.

"Plans Go Forth for Dedication of Menasha's New Bridge Aug. 31." Menasha Record, 20 August 1929.

Scott, John S. A Dictionary of Civil Engineering. Baltimore: Penguin Books, Inc., 1958; Revised, 1956.

"Tayco Street Bridge Closed." Menasha Record, 26 July 1929.

Waddell, J.A.L. Bridge Engineering vol. 1. New York: John Wiley & Sons, Inc., 1925.

Whitney, Charles S. Bridges: Their Art, Science and Evolution. New York: W.E. Rudge, 1929; Reprint, New York: Greenwich House, 1983.

Who's Who in Engineering. New York: American Association of Engineering Societies, 1925 & 1937.

Wilson, W.M. "Types of Moveable Bridges." Journal of the Western Society of Engineers 19 (June 1914): 549-589.

Prepared by:

John N. Vogel, Ph.D.
Heritage Research, Ltd.
N89 W16785 Appleton Avenue
Menomonee Falls, Wisconsin
10 March 1993

PART IV. PROJECT INFORMATION

This project has been sponsored by the Wisconsin Department of Transportation. The DOT's District 3, located at Green Bay, Wisconsin, served as the contracting agency. The project was undertaken by Dr. John N. Vogel, Principal Investigator and Historian for Heritage Research, Ltd., who provided the historical data, technical data and most of the photographic work. Vogel was assisted by Mr. Kevin Abing, a Doctoral Candidate at Marquette University, Milwaukee. The photographic copies of the blueprint copies, as well as all the archival processing and printing, were completed by Mr. Wayne Chandler, formerly of Mayfair Photography, Milwaukee.

TAYCO STREET BRIDGE
HAER NO. WI-68
Page 25

Tayco Street Bridge
UTM Coordinates:
16/383940/4894730